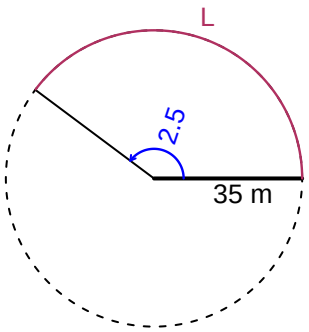
Name: Date:

Trig Final (SLTN v655)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 35 meters. The angle measure is 2.5 radians. How long is the arc in meters?

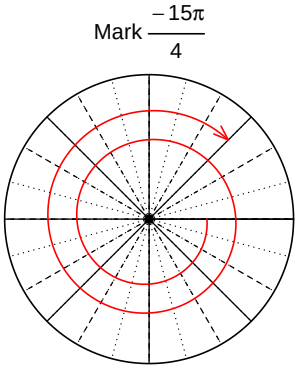


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

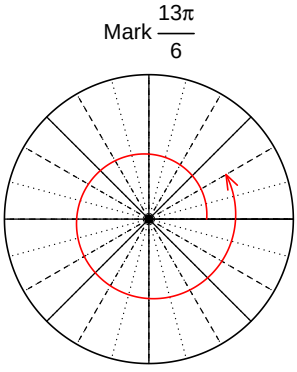
$L = 87.5$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(-15\pi/4)$



Find $\sin(13\pi/6)$

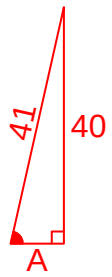
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(13\pi/6) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{-40}{41}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

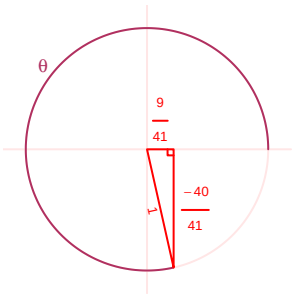
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 40^2 = 41^2$$
$$A = \sqrt{41^2 - 40^2}$$
$$A = 9$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-40}{41}}{\frac{9}{41}} = \frac{-40}{9}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 7.63 meters, a frequency of 8.68 Hz, and a midline at $y = 4.26$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.63\cos(2\pi 8.68t) + 4.26$$

or

$$y = 7.63\cos(17.36\pi t) + 4.26$$

or

$$y = 7.63\cos(54.54t) + 4.26$$